



भारत मौसम विज्ञान विभाग  
INDIA METEOROLOGICAL DEPARTMENT  
Climate Research and Services (CRS)

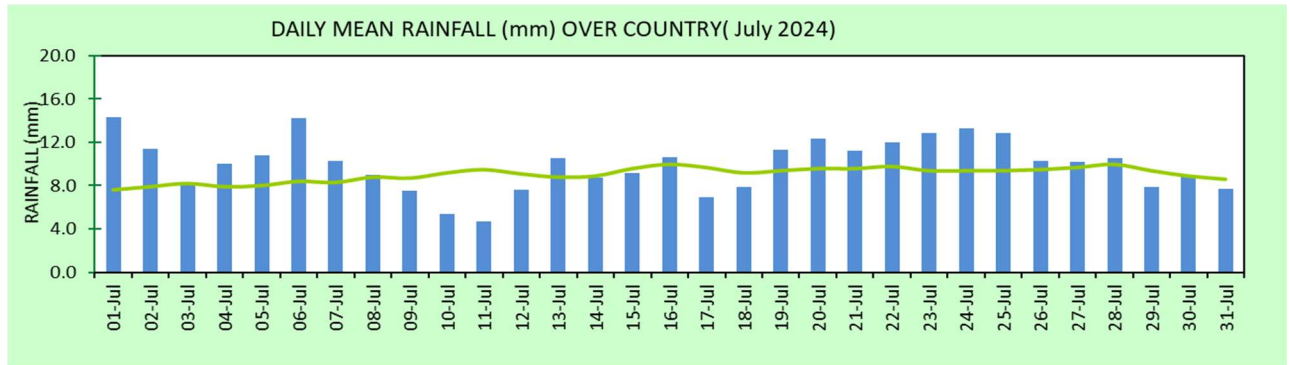
**Climate Summary for the month of JULY 2024**

**1. Monthly Rainfall Scenario for July 2024**

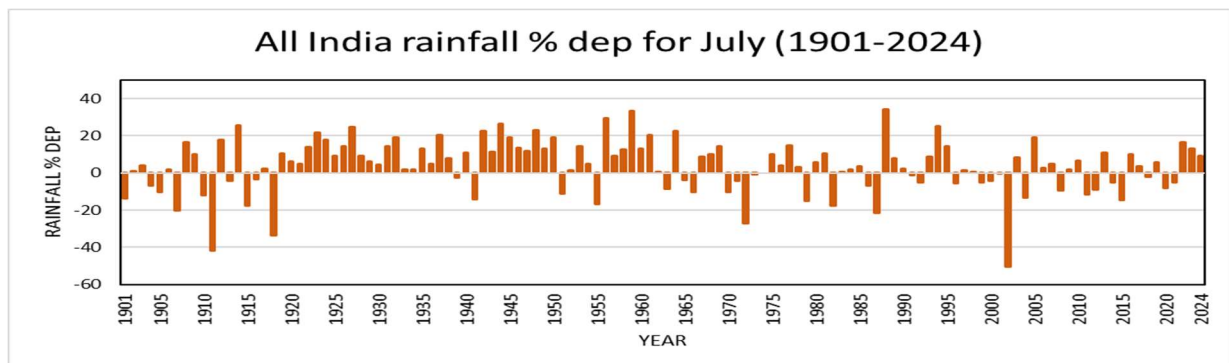
Rainfall over the country as a whole for the month of July 2024 was 305.8 mm which is 9% more than its Long Period Average (LPA) of 280.5 mm.

Daily variation of the rainfall over the country as a whole during the month of July 2024 with normal based on data of 1971-2020 is presented in Fig 1 (a). The all India rainfall percentage departure from normal for July during 1901-2024 is presented in Fig 1(b).

Rainfall over All India (305.8 mm) was the 43<sup>rd</sup> highest since 1901 and 6<sup>th</sup> highest since 2001, presented in Fig 1(c). Rainfall over the homogeneous region of Central India (427.2 mm) was the 12<sup>th</sup> highest since 1901 and the 2<sup>nd</sup> highest since 2001, presented in Fig 1(d). The rainfall over South Peninsular India (279.2 mm) was the 14<sup>th</sup> highest since 1901 and 5<sup>th</sup> highest since 2001 presented in Fig 1(e). However, Rainfall over East and Northeast India (325.3 mm) was the 12<sup>th</sup> lowest since 1901 and 8<sup>th</sup> lowest since 2001, as presented in Fig 1(f).



**Fig.1 (a): Daily variation of rainfall over the country as a whole during July 2024.**



**Fig. 1(b): All India monthly rainfall percentage departure from normal (1971-2020) for July from 1901-2024.**

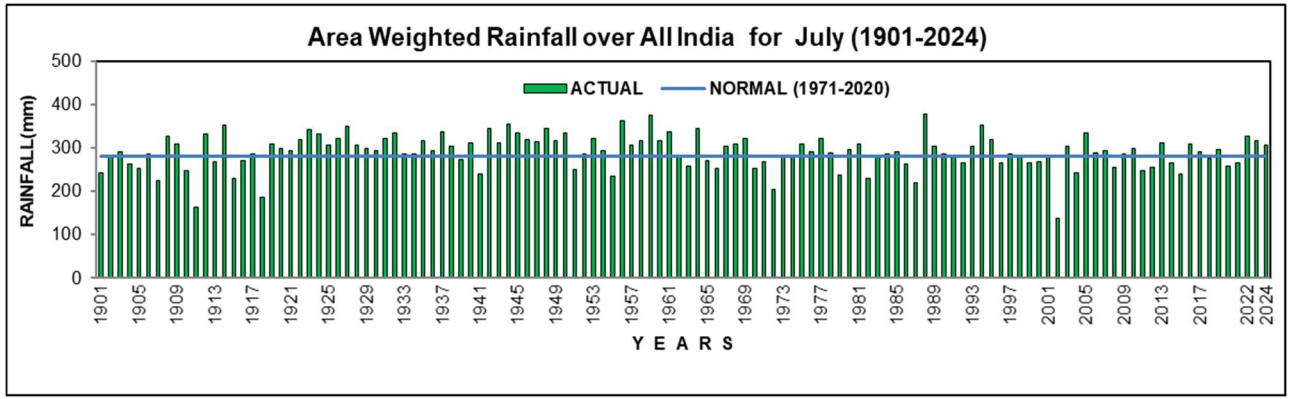


Fig. 1(c): Time series of area weighted rainfall over All India for July (1901 – 2024).

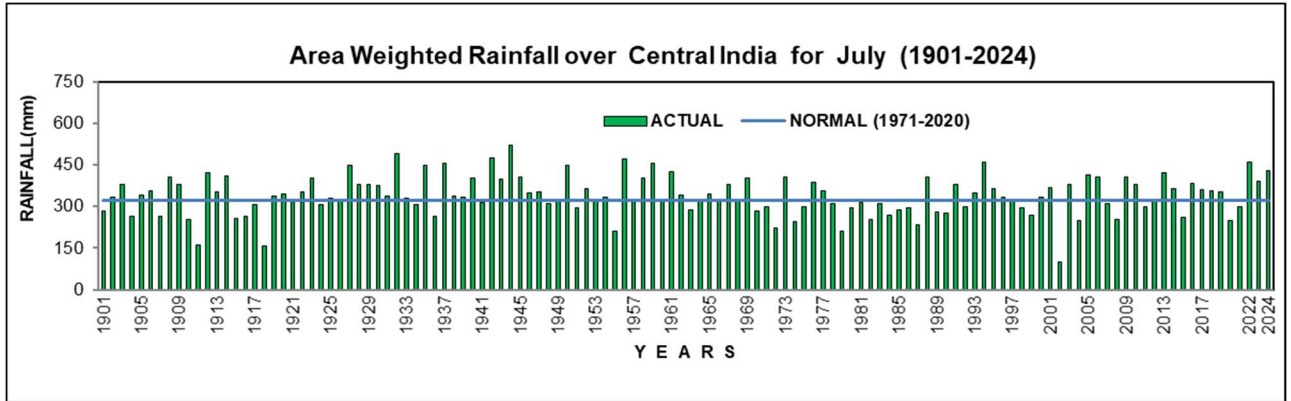


Fig. 1(d): Time series of area weighted rainfall over Central India for July (1901 – 2024).

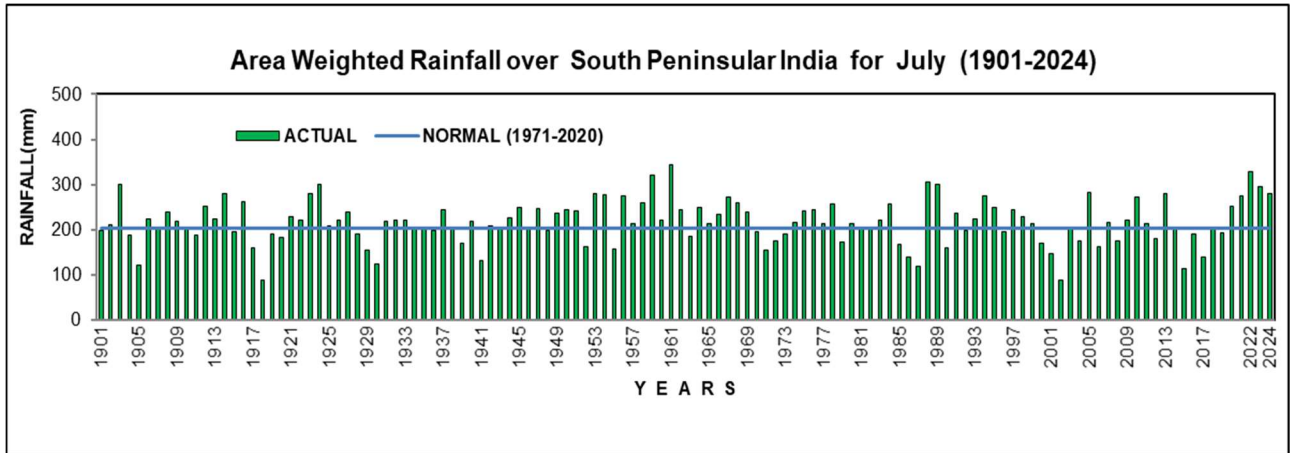


Fig. 1(e): Time series of area weighted rainfall over South Peninsular India for July (1901 – 2024).

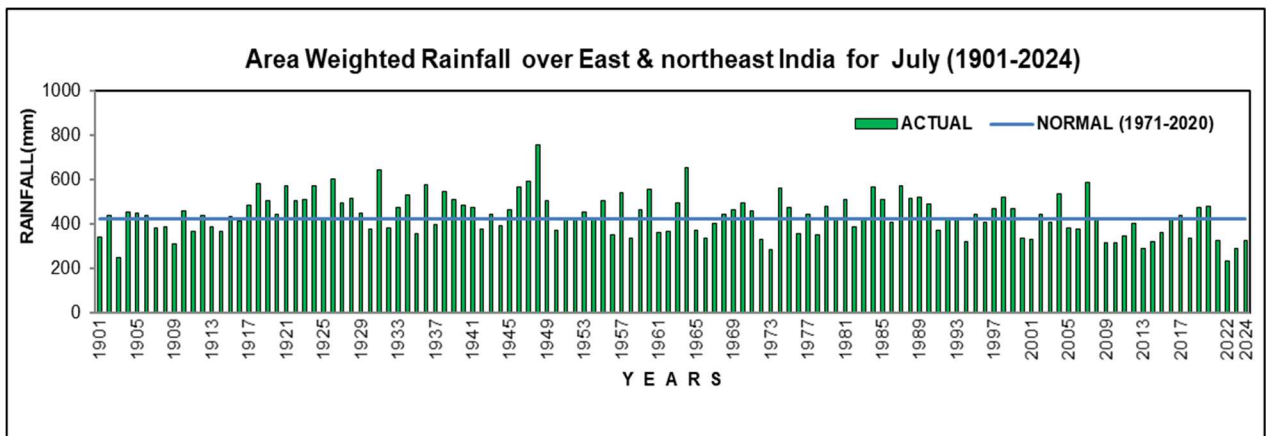
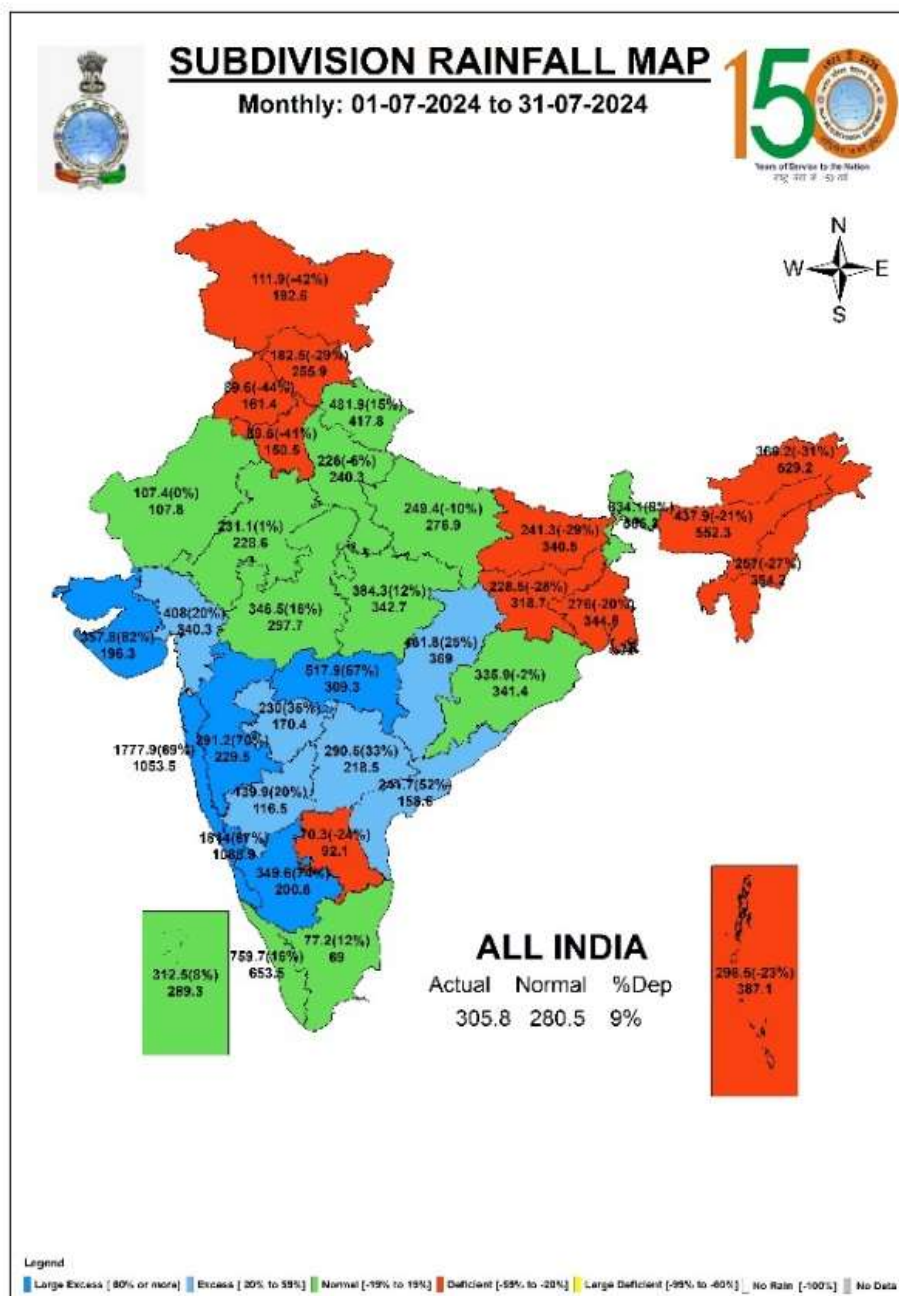


Fig. 1(f): Time series of area weighted rainfall over East and Northeast India for July (1901 – 2024).

The monthly rainfall for **July 2024** is given in the table below:

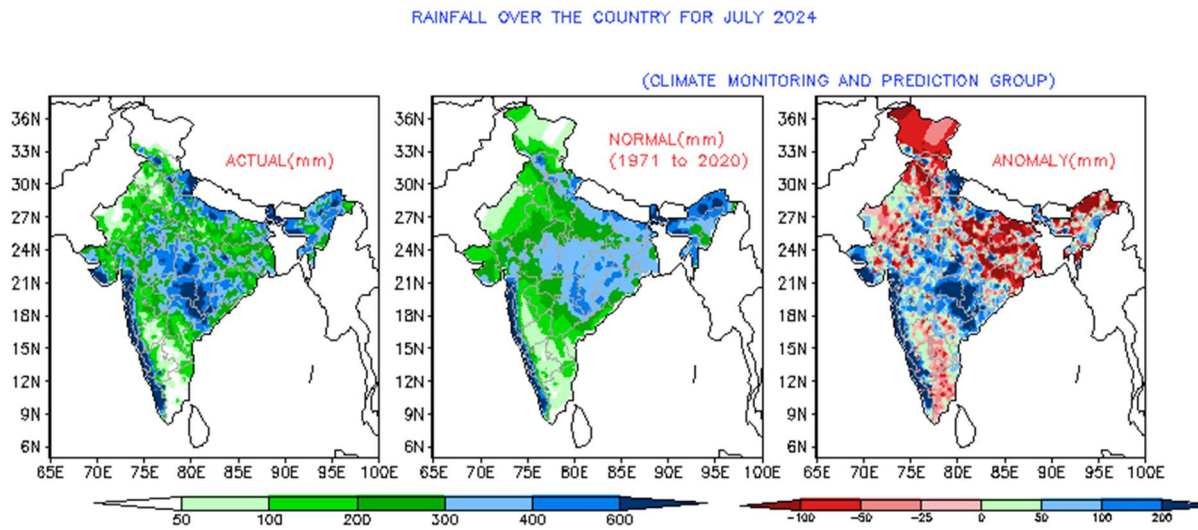
Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	305.8	280.5	9.0
Northwest India	179.7	209.7	-14.3
Central India	427.2	321.3	33.0
South Peninsula	279.2	204.5	36.5
East & northeast India	325.3	424.1	-23.3

During July 2024, 6 sub-divisions received large excess, 6 received excess, 12 received normal, and 12 received deficient rainfall (Fig. 2).



**Fig 2: Subdivision-wise rainfall distribution for July 2024.**

The observed spatial distribution of rainfall during July 2024, normal rainfall based on data from 1971 to 2020 and rainfall departures from normal during July 2024 are shown in Fig 3.



**Fig. 3: Observed spatial Rainfall pattern for the month of July 2024 over India and their departure from normal (1971 to 2020 period).**

**Departure from normal is anomaly = actual rainfall - normal rainfall.**

## 2. Frequency of Heavy Rainfall events.

July 2024 witnessed extremely very heavy rainfall events ( $\geq 204.4$  mm) mainly along the west coast of India, Assam & Meghalaya, Saurashtra and & Kutch and some regions along the foothills of the Himalayas (Uttarakhand and Utter Pradesh). In the month, Very heavy rainfall events (115.6 – 204.4 mm) were reported over many places in central parts of India along the western Ghat region. The heavy rainfall events (64.5 – 115.5 mm) were observed over many locations in most parts except Jammu & Kashmir & Ladakh.

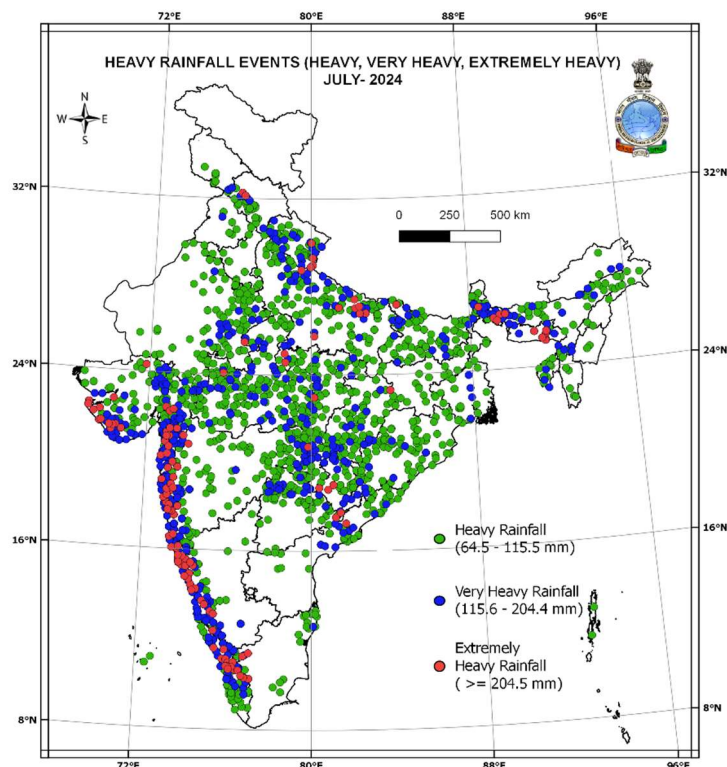
The location of occurrences of heavy, very heavy and extremely heavy rainfall events is shown in Figure 4. Out of 1650 occasions, 130 were extremely heavy rainfall ( $\geq 204.4$  mm), 454 were very heavy rainfall (115.6 to 204.4 mm), and 1066 were heavy rainfall (64.5 to 115.5 mm) categories during this month.

The details of some of the significant extreme rainfall events are given below;

Exceptional heavy rainfall events			
Location	Station/District	Rainfall amount in cm	Date
West UP and Uttarakhand	Baheri (dist Bareilly)	46cm	8 July
	Banbasa ( dist. Champawat)	43cm	
Saurashtra	Porbandar (dist Porbandar)-	49cm	19th July
	Kalyanpur (dist Devbhoomi Dwarka)-	29 cm	19th July



	Devbhoomi Dwarka	42cm	20th July
Madhya Maharashtra	Tamini (Pune Dist)	56cm	25th July
	Lavasa (Pune Dist)	45cm	
	Lonavala_agri (dist Pune)	35cm	
Konkan and Goa	Panjim (North Goa)	36cm	14 July
Some of the Extreme Heavy Rainfall events			
Region	Date	Region	Date
Uttarakhand	6-8 July	West Uttar Pradesh	5-8 July
Konkan & Goa	7-9, 19-25 July	Madhya Maharashtra	21-26 July
Gujarat Region	16 and 21-26 July	Saurashtra	18-20 and 22-24 July
Mumbai	7-9, 11-12, 13-14 and 18-22 July	Pune	24-26 July 2024
Goa	7-9 and 12-19 July	Baroda	25th July and 26 July
Surat	25th -26 July	Kerala	29-30 July



(Only the highest category of rainfall event is considered for a station)

**Fig. 4: The location of occurrences of heavy and very heavy rainfall events in the month of July 2024.**

### 3. Chief Synoptic weather features observed during July 2024.

There were three low-pressure systems (LPS) formed during July 2024 (15-17, 18-23 and 26-28 Jul). Out of that, one system intensified into Depression (19 to 20 Jul). The track of the depression is presented in Fig 5. These LPS helped to increase monsoon circulation and get a good amount of rainfall over the central Indian region and the west coast of India. The details of the Low-pressure Systems formed over the Indian region during July are given below;

Year	Depression	Low	Total LPS		LPS days
2017	1	5	6		12
2018	1	2	3		19
2019	-	4	4		15
2020	-	2	2		7
2021	-	4	4		15
2022	1	3	4		22
2023	-	4	4		12
2024	1	2	3		11
climatology	1.45	1.83	3.27		13.56

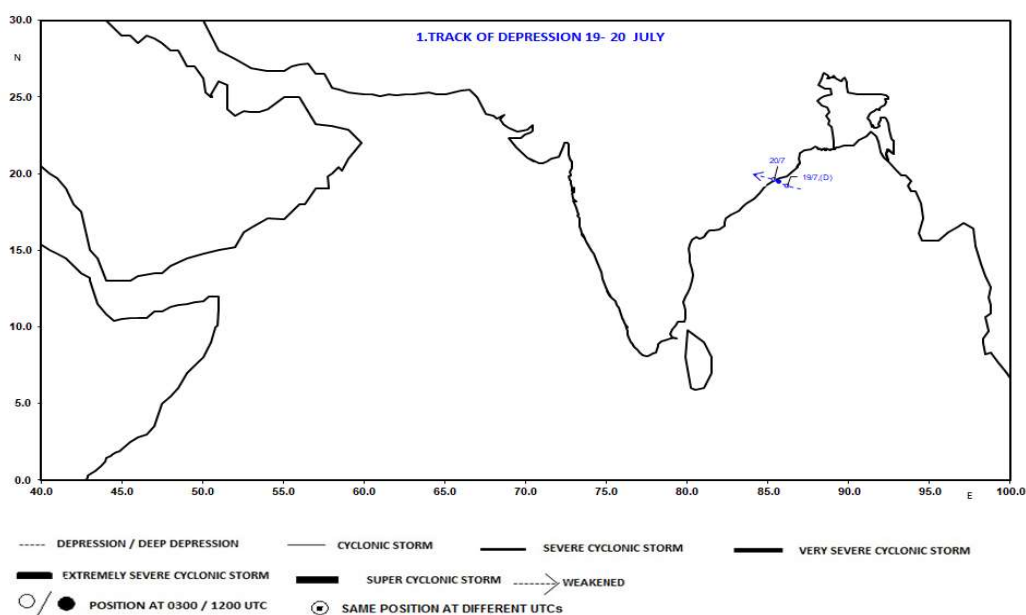


Fig. 5 Track of monsoon depression formed in July 2024

Western Disturbance (WD) activities were very weak in July. There were a total of three WDs (6-8, 15-19, 20-22 July) observed during July, and most of them were observed north of 30 degrees North. The monsoon trough lying south of its normal position, the low pressure system moving west-northwestwards across Central India and absence of WD activity caused below normal rainfall over the many subdivisions in Northwest India. Other important synoptic features of southwest monsoon are given below;

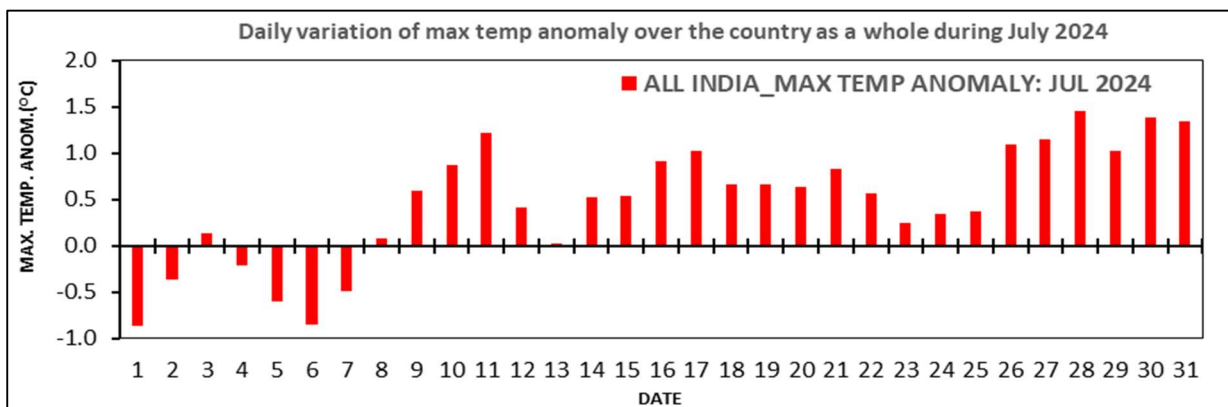
- The off-shore trough was active on most dates and observed mainly off south Gujarat- north Kerala coasts.
- Monsoon trough south of the normal position, vertically extended in the lower

levels and was active.

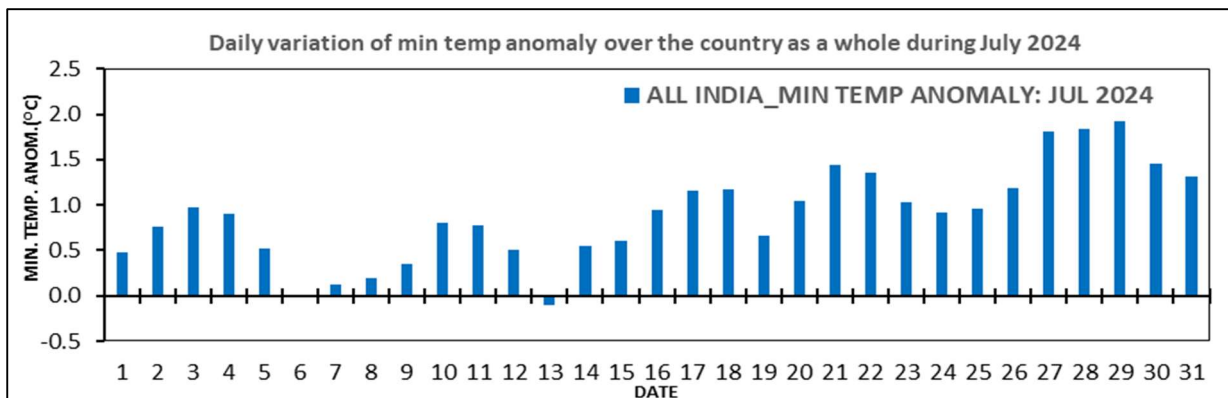
- Heat low was more intense than normal, with an average MSLP of 992 hPa against normal of 994 hPa and was west of normal position over Pakistan (normal position Pakistan and adjoining NW Rajasthan).
- Tropical Easterly Jet (TEJ) was stronger than normal (92 knots (kt) at 100 hPa against normal of 70kt for July). It was located north of the normal position on most dates.
- East-west Shear line at Mid-troposphere on most dates.

#### 4. Characteristics of Temperatures for the month of July 2024

The average maximum, average minimum and mean temperature for the country as a whole during July 2024 were 32.31°C, 24.99°C and 28.65°C respectively, against the normal of 31.79°C, 24.10°C and 27.95°C based on data of 1991-2020. Thus, the average maximum, average minimum and mean temperature were above normal with departure from normal of 0.52°C, 0.89°C and 0.70°C respectively for the country as a whole. The daily variation of maximum and minimum temperature departure from normal over the country as a whole for July 2024 is shown in the Figure 6(a) and (b) respectively.



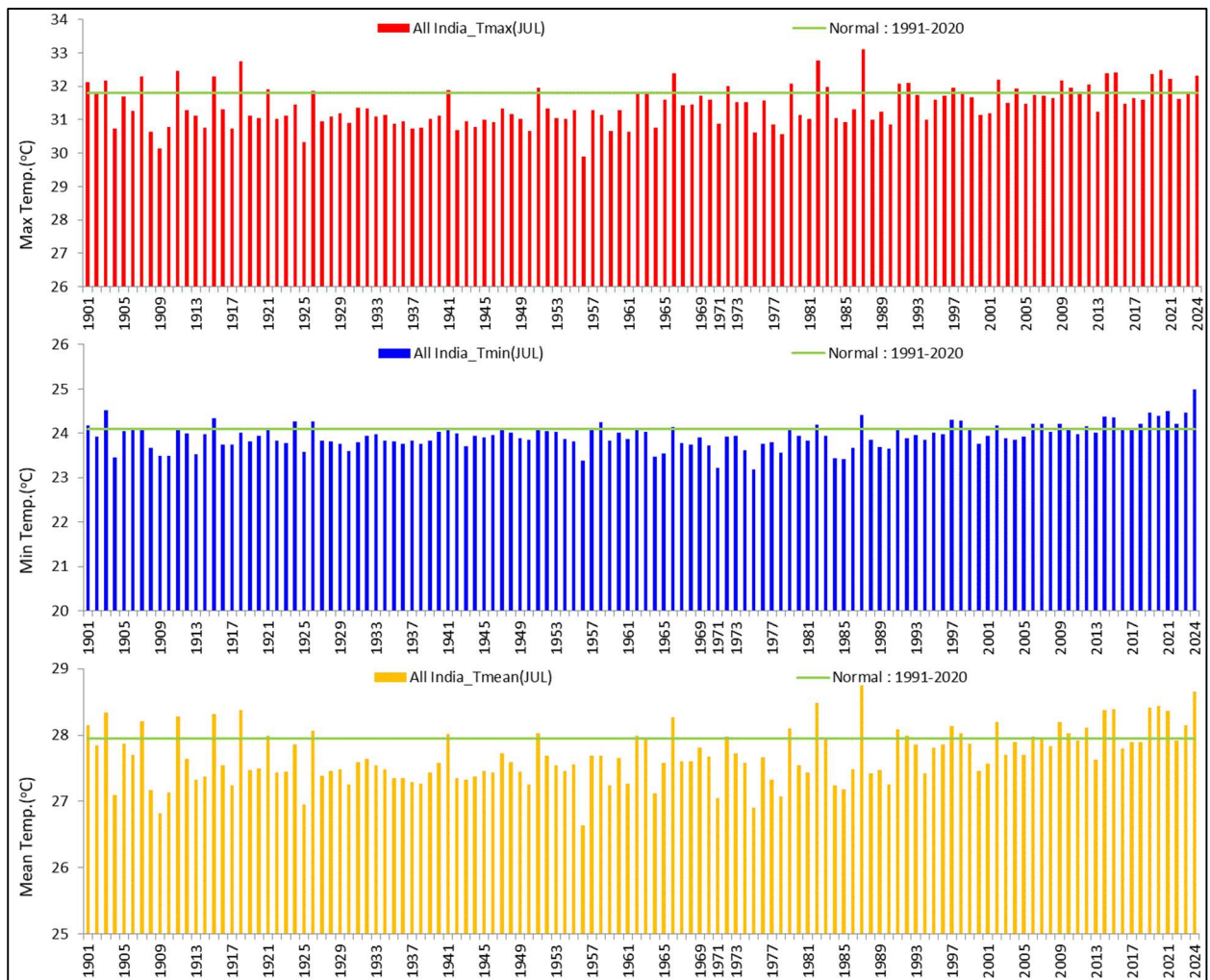
**Fig. 7(a): Daily variation of maximum temperature anomaly (departure from normal) over the country as a whole for July 2024**



**Fig. 6(b): Daily variation of minimum temperature anomaly (departure from normal) over the country as a whole for July 2024**

Figure 7 shows the time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of July 1901-2024. Over the country during July, the average maximum temperature was 32.31°C with departure from normal of 0.52°C (10<sup>th</sup> highest since 1901). The average minimum temperature was highest at 24.99°C since 1901 against the earlier record

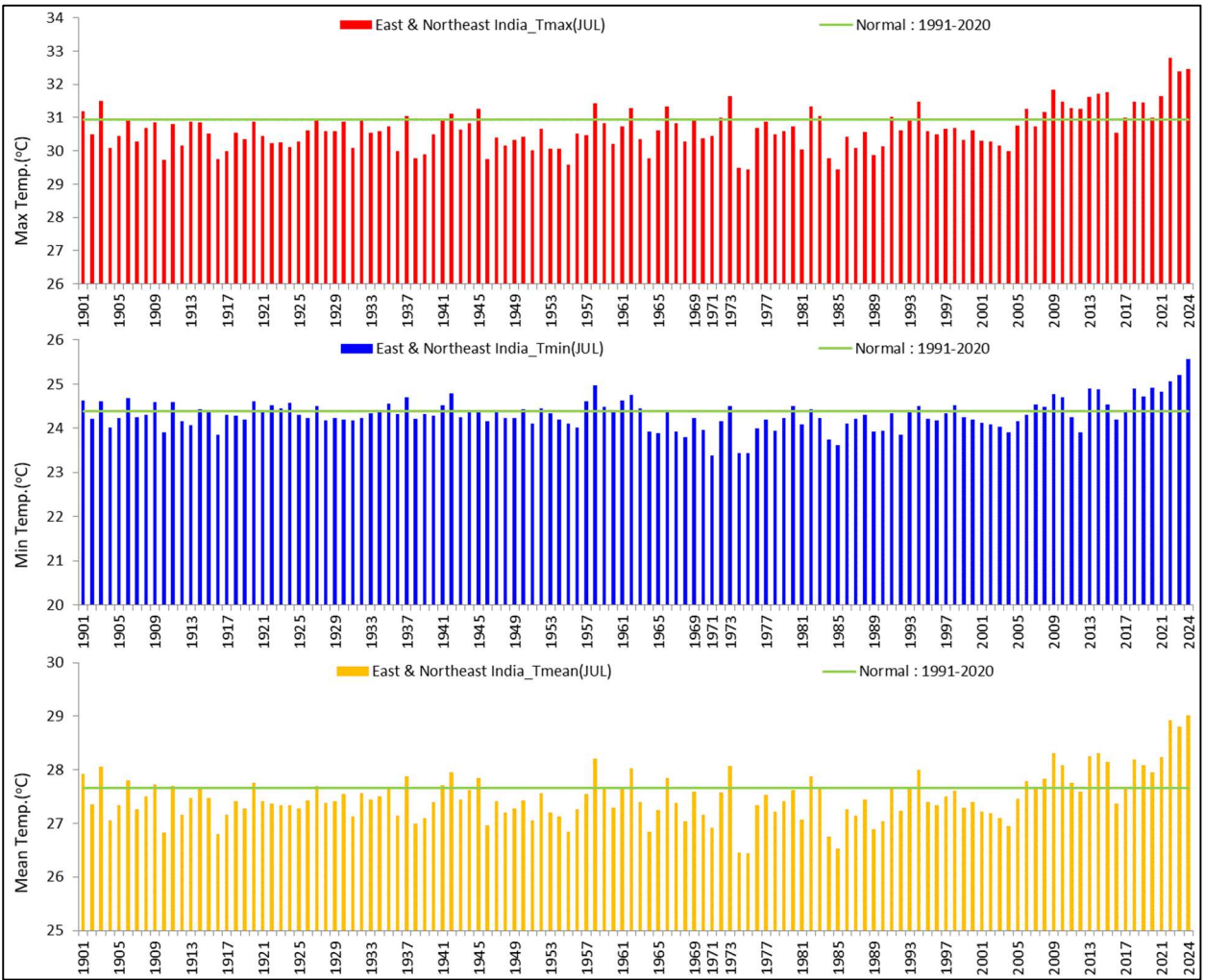
of 24.52°C in 1903. The mean temperature was 2<sup>nd</sup> highest (28.65°C with a departure from the normal of 0.70°C) after the year 1987(28.75°C) since 1901.



**Fig. 7: Time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of July 1901-2024**

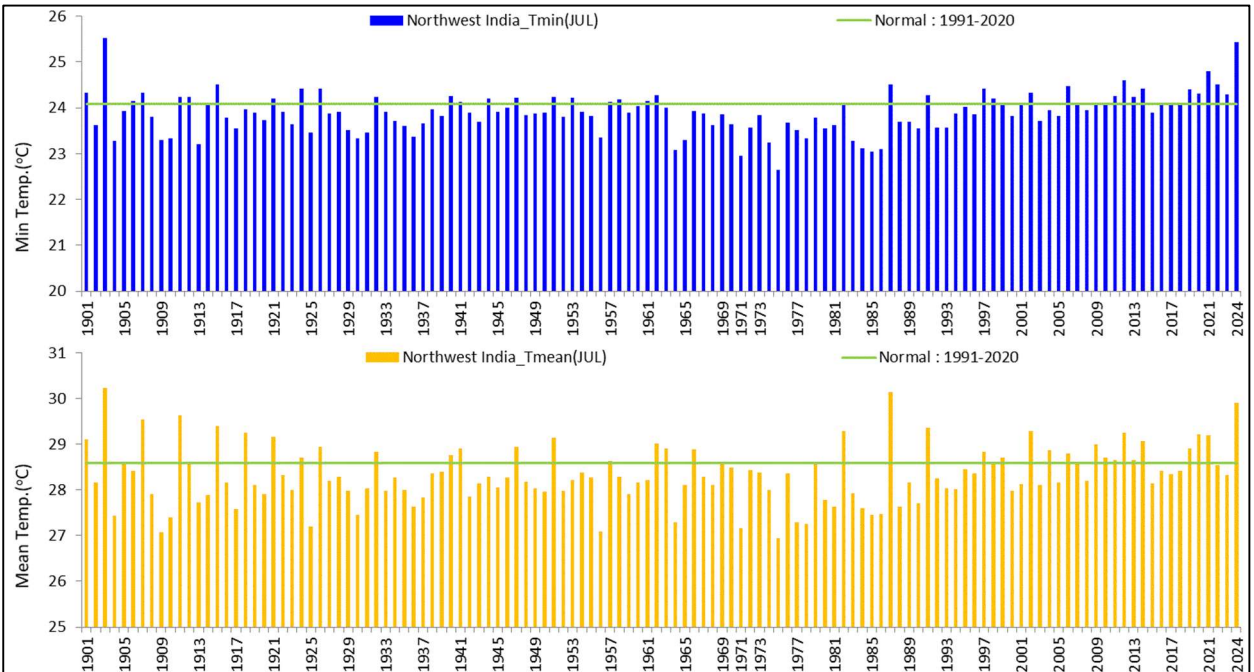
Figure 8 shows the time series of average maximum, average minimum and mean temperature over the East & Northeast India for the month of July 1901-2024. Over East & Northeast India during July, the average maximum temperature was 2<sup>nd</sup> highest (32.45°C with departure from normal of 1.50°C) after the year 2022(32.78°C) since 1901. The average minimum temperature was highest at 25.57°C since 1901 against the earlier record of 25.21°C in 2023. The mean temperature was highest at 29.01°C since 1901 against the earlier record of 28.92°C in 2022.





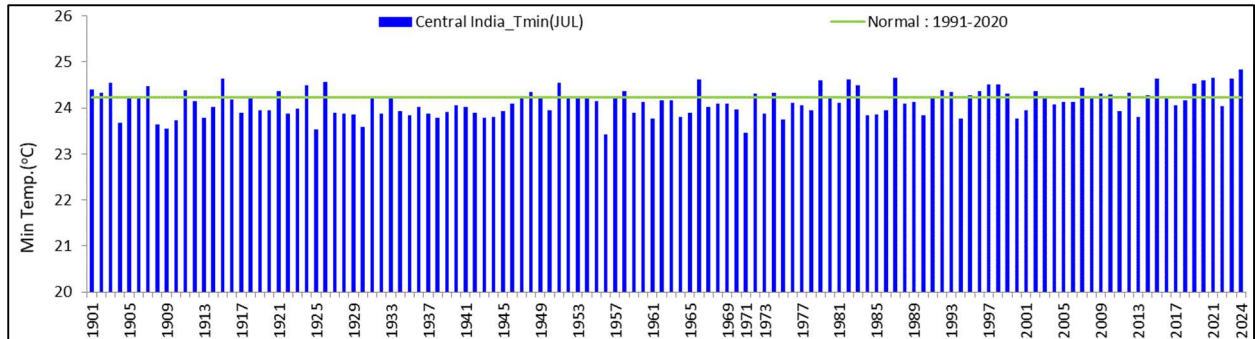
**Fig. 8: Time series of monthly average maximum, average minimum and mean temperature over East & Northeast India for the month of July 1901-2024**

Figure 9 shows time series of average minimum and mean temperature over the Northwest India for the month of July 1901-2024. Over Northwest India during July, the average minimum temperature was 2<sup>nd</sup> highest (25.42°C with departure from normal of 1.34°C) after the year 1903(25.53°C) since 1901. The mean temperature was 3<sup>rd</sup> highest (29.91°C with departure from normal of 1.33°C) after the years 1903(30.24°C) and 1987(30.15°C) since 1901.



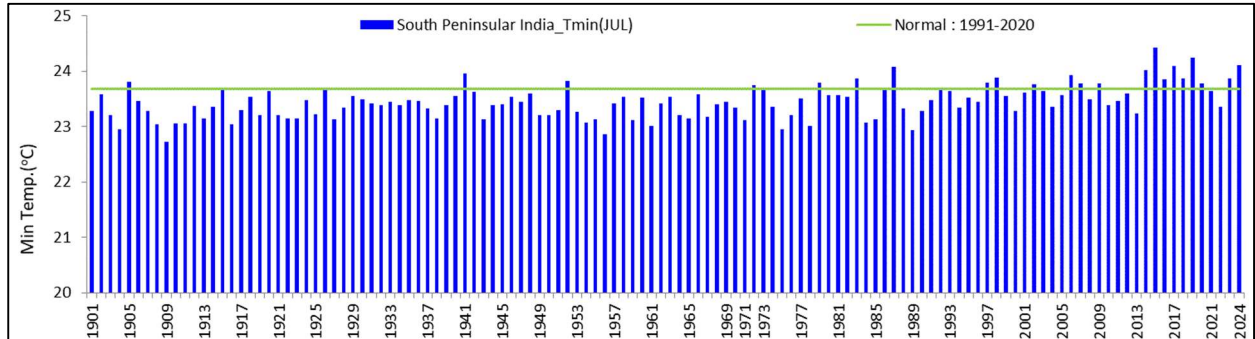
**Fig. 9: Time series of monthly average minimum and mean temperature over Northwest India for the month of July 1901-2024**

Figure 10 shows the time series of average minimum temperature over the Central India for the month of July 1901-2024. Over Central India during July, the average minimum temperature was highest at 24.84°C since 1901 against the earlier record of 24.66°C in 1987. The five highest temperature records are considered.



**Fig. 10: Time series of monthly average minimum temperature over Central India for the month of July 1901-2024**

Figure 11 shows the time series of average minimum temperature over the South Peninsular India for the month of July 1901-2024. Over South Peninsular India during July, the average minimum temperature was 3<sup>rd</sup> highest (24.12°C with departure from normal of 0.43°C) after the years 2015(24.43°C) and 2019(24.25°C) since 1901.



**Fig. 11: Time series of monthly average minimum temperature over South Peninsular India for the month of July 1901-2024**

The Temperatures during July 2024 for all India and homogeneous regions with its top ranks since 1901 are given below:

JUL 2024		Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)
ALL INDIA	ACTUAL	32.31	24.99	28.65
	NORMAL	31.79	24.10	27.95
	ANOMALY	0.52	0.89	0.70
	Rank since 1901	10	1	2
NORTHWEST INDIA	ACTUAL	34.40	25.42	29.91
	NORMAL	33.08	24.09	28.58
	ANOMALY	1.32	1.34	1.33
	Rank since 1901	8	2	3
EAST & NORTHEAST INDIA	ACTUAL	32.45	25.57	29.01
	NORMAL	30.95	24.38	27.67
	ANOMALY	1.50	1.19	1.34
	Rank since 1901	2	1	1
CENTRAL INDIA	ACTUAL	31.13	24.84	27.99
	NORMAL	31.30	24.24	27.77
	ANOMALY	-0.16	0.60	0.22
	Rank since 1901	49	1	28
SOUTH PENNINSULAR INDIA	ACTUAL	31.01	24.12	27.56
	NORMAL	31.44	23.68	27.56
	ANOMALY	-0.43	0.43	0.00
	Rank since 1901	53	3	26

Note: Values are rounded off to the nearest two decimals.

The five highest temperature records with corresponding top ranks since 1901 along with year of occurrence for East & Northeast India (Tmax, Tmin, Tmean), All India, Northwest India (TMin, TMean) and Central India, South Peninsular India (TMin) are given in the table below:

East & Northeast India (July 2024)					All India (July 2024)					Northwest India (July 2024)				
Year	TMax	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank
2022	32.78	30.95	1.83	1	2024	24.99	24.10	0.89	1	1903	25.53	24.09	1.44	1
2024	32.45		1.50	2	1903	24.52		0.42	2	2024	25.42		1.34	2
2023	32.39		1.44	3	2021	24.50		0.41	3	2021	24.79		0.71	3
2009	31.84		0.89	4	2023	24.471		0.37	4	2012	24.60		0.51	4
2015	31.75		0.81	5	2019	24.465		0.37	5	1915	24.51		0.43	5

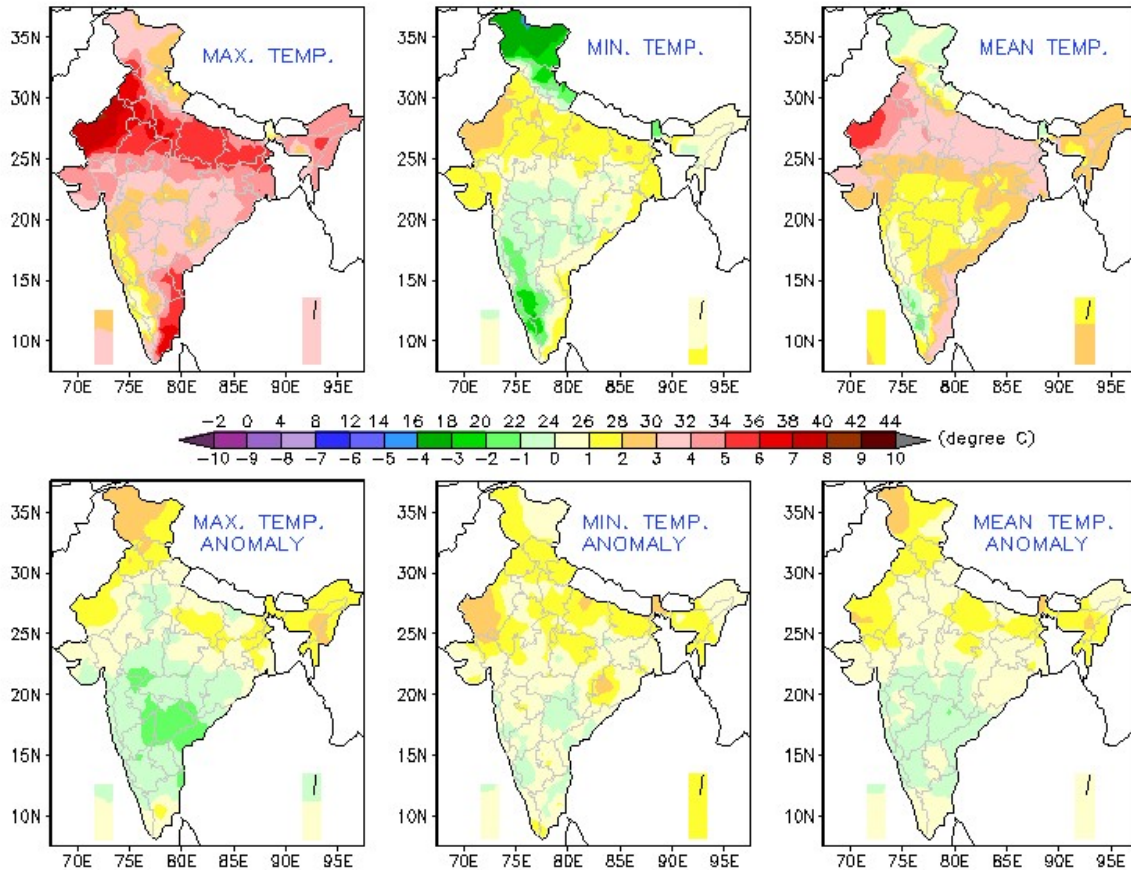
East & Northeast India (July 2024)					All India (July 2024)					Northwest India (July 2024)				
Year	TMin	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank
2024	25.57	24.38	1.19	1	1987	28.75	27.95	0.81	1	1903	30.24	28.58	1.66	1
2023	25.21		0.83	2	2024	28.65		0.70	2	1987	30.15		1.56	2
2022	25.06		0.68	3	1982	28.48		0.53	3	2024	29.91		1.33	3
1958	24.98		0.60	4	2020	28.44		0.50	4	1911	29.63		1.05	4
2020	24.91		0.53	5	2019	28.42		0.47	5	1907	29.54		0.96	5

East & Northeast India (July 2024)					Central India (July 2024)					South Peninsular India (July 2024)				
Year	TMean	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank
2024	29.01	27.67	1.34	1	2024	24.84	24.24	0.60	1	2015	24.43	23.68	0.75	1
2022	28.92		1.26	2	1987	24.66		0.42	2	2019	24.25		0.56	2
2023	28.80		1.13	3	2021	24.65		0.41	3	2024	24.12		0.43	3
2009	28.31		0.64	4	2023	24.64		0.40	4	2017	24.09		0.41	4
2014	28.30		0.64	5	2015	24.63		0.39	5	1987	24.08		0.40	5

The observed spatial temperature pattern of monthly average maximum, average minimum and mean temperature over India and their departures from normal (1991 to 2020 period) for the month of July 2024 is given in Figure 12.

TEMPERATURE & ITS ANOMOLY FOR THE MONTH JULY 2024



**Fig. 12: Observed spatial temperature pattern of monthly average maximum, average minimum, and mean temperature over India (top three from left to right) and their departure from normal (1991 to 2020 period) for July 2024 (lower three from left to right)**

**5. Significant Weather Events during the month of July 2024:**

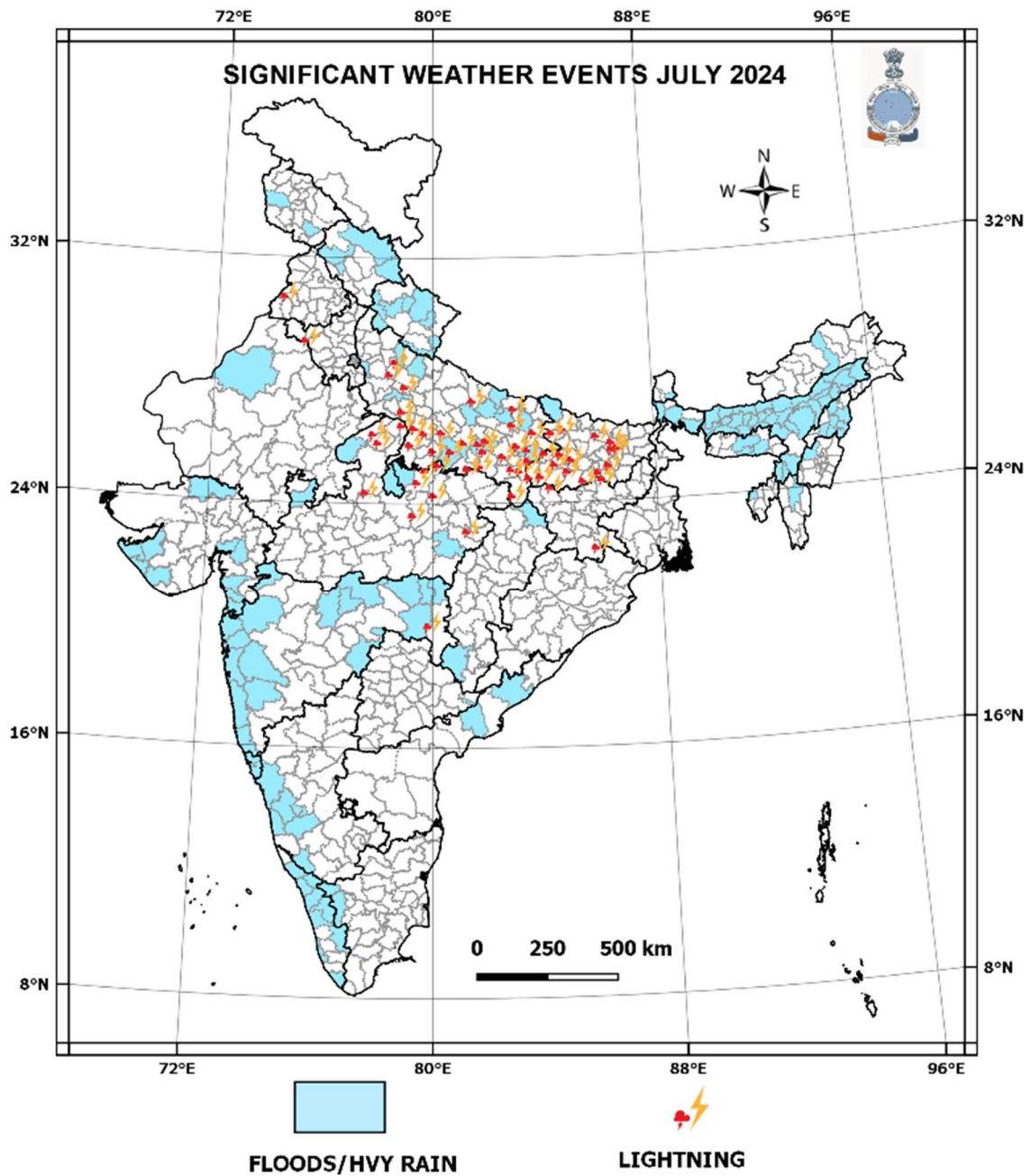
During July, a total of about 700 people reportedly died (including 385 loss of life due to a massive Landslide associated with Heavy rainfall over the Wayanad district of Kerala), more than 290 were injured, about 250 were reportedly missing, and more than 1200 livestock perished, as per the media report. The details of event-wise casualties are given below. However, the actual data on casualties and damages may be available from concerned state governments.

Event	Number of human deaths
<b>Monsoon related Heavy Rains, Floods &amp; Landslide:</b>	412 (Kerala), 64 (Assam), and 59 from remaining parts of India (Maharashtra, Uttar Pradesh, Uttarakhand, Karnataka, Goa, Mizoram, Rajasthan, Nagaland, Delhi, Manipur, Tripura, Arunachal Pradesh, Himachal Pradesh, Sikkim, Jammu and Kashmir)
<b>Lightning:</b>	98 from Uttar Pradesh, 47 from Bihar, and 17 from the remaining parts of the country



(Madhya Pradesh, Jharkhand, Punjab,  
Haryana, Maharashtra)

The fig13 shows the high impact weather events observed in July 2024.



**Fig.13: The significant weather events during July 2024 (Based on real-time media reports, situation report from Disaster Management Authority and flood information from Central Water Commission)**

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